

NON-PUBLIC?: N
ACCESSION #: 8803010127
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Waterford Steam Electric Station Unit 3 PAGE: 1 of 5

DOCKET NUMBER: 05000382

TITLE: Reactor Manually Tripped When Reactor Coolant Pump Upper Thrust Bearing Overheated Due to a Clogged Lube Oil Strainer.
EVENT DATE: 01/26/88 LER #: 88-002-00 REPORT DATE: 02/25/88

OPERATING MODE: 1 POWER LEVEL: 086

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: E.E. Rogers, Systems Engineering Department Head
TELEPHONE #: 504-464-3125

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: At 1019 hours on January 26, 1988, Waterford Steam Electric Station Unit 3 was at 86% power when the Reactor was manually tripped due to high temperature on Reactor Coolant Pump (RCP) 2B Upper Thrust Bearing (UTB). The UTB temperature had been slowly rising for 3 days. At 0730 hours it was noted that the temperature was near the limit and a shutdown was anticipated later in the day. At 1000 hours temperature began to increase markedly and a rapid shutdown was commenced. At 1019 hours the UTB temperature exceeded the predetermined limit and the Reactor was manually tripped. Steam Generator levels dropped low enough to actuate the Emergency Feedwater (EFW) System but not low enough to initiate EFW Flow. RCP 2B was secured after the Reactor trip. All automatic systems and protective features functioned as designed.

The root cause of this event was a clogged oil strainer in the UTB lube oil system. RCP 2B UTB overheating due to a clogged strainer has now resulted in three forced outages. During the recovery from this event the small mesh strainer was replaced with a larger mesh strainer. There was no indication of damage to RCP 2B or its motor. Since the Reactor was manually tripped to avoid damage to plant equipment, there was no safety significance to this event.

(End of Abstract)

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At 1019 hours on January 26, 1988 Waterford Steam Electric Station Unit 3 was at 86% power when the Reactor (EIIS Identifier AB-RCT) was manually tripped due to high temperature on Reactor Coolant Pump (RCP) (EIIS Identifier AB-P) 2B Upper Thrust Bearing (UTB). The UTB temperature is normally below 190 degrees Fahrenheit, but had been slowly rising for approximately three days. At 0730 hours on January 26, 1988 it was noted that UTB temperature was 199.5 degrees Fahrenheit with an upward trend that might rise high enough to require a plant shutdown. A plant shutdown is required when UTB temperature reaches 205 degrees Fahrenheit. Previous experience has shown UTB temperature settles at approximately 200 degrees Fahrenheit for several days before continuing to rise. At 1000 hours the UTB temperature began to increase rapidly and exceeded 205 degrees Fahrenheit. A decision was made to trip the plant if 210 degrees Fahrenheit was exceeded and a rapid downpower was commenced at a rate of 1% power per minute. At 1019 hours, UTB temperature reached 210 degrees Fahrenheit and the reactor was manually tripped. The trip caused Steam Generator (EIIS Identifier AB-SG) levels to drop low enough to actuate the Emergency Feedwater (EFW) System (EIIS Identifier BA) but not low enough to initiate EFW flow. RCP 2B was secured manually shortly after the trip. All automatic safety systems operated properly and procedure OP-902-001 "Uncomplicated Reactor Trip Recovery" was entered at 1025 hours. The plant was then stabilized in Hot Standby. RCP 2B UTB temperature dropped below 195 degrees Fahrenheit within two minutes of the trip and continued to decrease to its normal temperature range.

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The root cause of the overheated UTB was the accumulation of an unknown material that has the appearance of a fine fibrous "lint" in the upper reservoir oil strainer in RCP 2B Motor. A preliminary laboratory analysis indicates the material may be crystal buildup due to degradation of the oil. This material clogged the lube oil flow through the strainer and therefore restricted lube oil flow through the bearing. Since the first refueling outage in December 1986, Waterford SES Unit 3 has had to shut down three times due to clogging of RCP 2B UTB lube oil strainer. The Thrust Bearings are self-lubricated during normal operation by drawing lube oil from a reservoir. The oil is drawn through openings near the top and bottom of the cylinder surrounding the thrust bearing, pumped through the bearing, and expelled through ports to the main oil cooler for the upper bearing housing. The oil is cooled and then passes through the strainer to return to the bearing reservoir. Clogging of the strainer therefore restricts bearing oil flow by blocking the oil discharge path from the bearing. The strainer is an Elliott Type F Single Strainer with 200 Mesh 304 Stainless Steel Wire Cloth.

The first shutdown occurred in early September 1987. An increasing temperature difference was noted across the upper oil cooler with a corresponding increase in UTB temperature, indicating that the strainer was restricting flow. The upward trend continued for 3-4 weeks before UTB temperature was high enough to require the plant to be shutdown. The plant was shutdown and the strainer replaced. Inspection of the strainer was satisfactory and no defects were discovered. In late December 1987, the strainer clogged again after approximately three weeks of the same increasing temperature symptoms. The strainer again showed no sign of failure, but was replaced with a clean strainer.

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During the recent shutdown the 200 Mesh Strainer was replaced with a 64 Mesh Strainer. The manufacturer does not believe that minute amounts of "lint" will pose a problem to the motor bearings. Waterford 3's System Engineers co curred and decided to use a larger mesh strainer rather than remove the strainer altogether. The larger mesh strainer should pass the fine particles clogging the smaller mesh strainer, but it is a small enough mesh to catch metal particles if the bearing were to fail. The location of the strainer between the bearing discharge and the bearing oil reservoir does not prevent particles from entering the bearings and will only catch particles that have already passed through the bearings.

The removed strainer was cleaned and inspected and no defects were discovered. The fibrous "lint" was inadvertently discarded, but a sample of the oil from the clogged strainer was sent to Southwest Research Institute for chemical analysis. The oil sample was analyzed and insoluble adipic acid crystals were discovered. These crystals could have built up on a small mesh strainer to clog it. Adipic acid is the product of hydrolysis of the lube oil which may be induced by contamination with small amounts of water. The reaction may also be catalyzed by high temperatures. There were no indications of imminent bearing failure. The RCP 2B lube oil sample analysis results will be compared to lube oil system samples from the other three RCP's during Refuel Outage 2 in April 1988. In Refueling Outage 1 RCP 2B was cleaned and inspected. During Refueling Outage 2 in April 1988, RCP 2B is scheduled for bearing refurbishment. At that time a complete bearing and lube oil system inspection will be performed. There have been no similar problems with the other three RCP's and they were fully operational throughout the event.

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The worst case scenario for a RCP Motor UTB failure would result in the babbitt being wiped from the UTB. This would not immediately result in the RCP

tripping or seizing but would require the RCP to be shut down as soon as possible to minimize any further damage. Whenever the UTB temperature indicates an upward trend the temperature is very closely monitored and evaluated. The best information available concerning these bearings indicates that no damage will occur to the UTB below 215 degrees Fahrenheit. Since the RCP was secured manually and temperature did not exceed 211 degrees Fahrenheit there is a high level of confidence that there was no significant degradation of the bearing during this event.

The Reactor was manually tripped to avoid damage to plant equipment, and even if the affected bearing had failed it would have been unlikely to have resulted in a trip or seizure of the pump. A RCP Motor is not safety related equipment at Waterford 3. There was therefore no safety significance to this event.

SIMILAR EVENTS

None

PLANT CONTACTS

E.E. Rogers, Systems Engineering Department Head, 504/464-3125.

ATTACHMENT # 1 TO ANO # 8803010127 PAGE: 1 of 1

Ref: 10CFR50.73(a)(2)(iv)

LOUISIANA

POWER & LIGHT/ WATERFORD 3 SES . P.O. BOX B . KILLONA, LA 70066
MIDDLE SOUTH
UTILITIES SYSTEM

February 25, 1988

W3A88-0019

A4.05

QA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

SUBJECT: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Reporting of Licensee Event Report

Attached is Licensee Event Report Number LER-88-002-00 for Waterford Steam Electric Station Unit 3. This report is submitted pursuant to 10CFR50.73(a)(2)(iv).

Very truly yours,

/s/ N S Carns
N. S. Carns
Plant Manager - Nuclear

NSC/WMC:rk

Attachment

cc: R.D. Martin, NRC Resident Inspectors Office, INPO Records Center
(J.T. Wheelock), E.L. Blake, W.M. Stevenson, D.L. Wigginton

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